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Chemical Composition of Essential Oil Extracted from Euphorbia Densa Schrenk and Evaluation Its Antioxidant Activity

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Abstract:
The essential oil have been extracted from the aerial parts of *Euphorbia densa Schrenk* from *euphorbiacea* family collected in south west of Hama in Syria by hydro-distillation using Clavenger type apparatus. The composition, the qualitative and quantitative analysis of the essential oil was achieved and characterized by means of GC-MS and comparing with the references in the literature. A total of 16 compounds representing 94% of the essential oil were characterized. The oil was dominated by four compounds representing the majority of the compenants: 1.8-ceniole (18.87%), carvacrol (13.32%), Linalool (13.61%), (*E*)-Caryophyllene (10.29%) The other compounds were mostly presented in low amounts. The antioxidant activity of the essential oil was evaluated
Keywords:Euphorbia densa Schrenk, euphorbiacea, hydrodistillation, Clavenger, essential oil, GC-MS, antioxidant activity.

1. Introduction

Euphorbiaceae family is one of largest families, it is composed of over 315 genera and nearly 8000 species and it is composed of a wide variety of plants [1]. Many Euphorbiaceae are well known to contain a large number of biologically active compounds, in particular skin irritant, tumour promoting and antitumour diterpene esters [2, 3]. The Plants of Euphorbiaceae are known to be toxic and poisonous. They provoke skin irritant, inflammatory and white milky latex, when the stems or leaves are cut or broken. Human and animal sufferings due to the accidental use of these plants are well docmnented [3].

The irritant latices of these plants have been shown to contain esters of polycyclic, polyfunctional diterpenes, such as phorbol, ingenol and their various derivatives which exhibit cancinogenic activity on mice back skin and it is known in different parts of the world as toxic and/or medicinal [4]. Euphorbia species have been widely used in folk medicine for treatment of diarrhea, inflammation,. Some of these species are endemic or confined in Syria. The euphorbia is well known with its latex, some latex causes dermatitis and is injurious to the eyes. The latex isolated from *Euphorbiu fulcutu L.*has been used by the natives as a powerful purgative. The isolation of 12-O-tetradeanoylphorbol-13-acetate, from the oil of *Croton tiglium L.* led to extensive investigations for detecting other promoters in Euphorbiaceae [4]. Some *Euphorbia* like *E. .fischeriana* are used in Chinese folk medicine. The honey collectors put out boxes for honey collection in the neighborhood of these plants, to provid bitter taste in the hony which is due to the irritant factor(s) in hony contained in the nectar and/or plants of Euphorbiacea [5, 6, 7,8]. As a part of our study to characterize the chemical constituents of syrian *Euphorbia* plants we have investigated the essential oil of euphorbia. In the present communication we wish to report the extraction and studying the chemical compstion of the essential oil of Euphorbia densa Schrenk and evatuate its antioxidant activity.

2. Taxonomic description of Euphorbia densa Schrenk:

Euphorbia densa Schrenk. is an annual glabrous plant, 5–15 cm. Stems dichotomously branched from base. The leaves are 1–1.4 cm long, opposite, sessile, obovate, somewhat tapering at base. Inflorescence umbellate, very dense. Flowers greenish. Fruit capsule about 3 mm. Flowering June–May. It is a poisonous plant for sheep and goats [8].

3. Experimental Procedure:

3.1 Plant Material

Aerial parts of *Euphorbia densa Schrenk*, were collected and dryied in August 2017, from south-est of Hama, Syria. The plant was authenticated by the Atomic Agent in Syria**.** A voucher specimen of plant was deposited in the laboratory of chemistry of natural products, Department of chemistry, Faculty of sciences, Albaath University, Homs, Syria.

3.2. Essential oils analysis

The analysis of the essential oil was performed with an Agilent 4890 gas chromatograph with a capillary column HP-5 ms (30×0.25×0.25 µm). Temperature program was as follows: 5 min at 50°C, increased to 240°C at a rate of 3°C min, then, increased to 300°C at a rate of 15°C min and finally held at that temperature for 3 min. Injection temperature was 290°C. Injection volume was 1.0 µL. Helium was used as a carrier gas (1 mL/min).

Tthe Retention indices were calculated using standard hydrocarbons (C8-C22, n-alkanes), injected in the same conditions of the samples. The identification of the constituents was performed by comparing the spectra obtained with database of Wiley Spectral Library Collection and NSIT library database. Quantitative data were obtained from the electronic integration of the FID peak areas

3.3. Extraction the essential oil:

The extraction of essential oil was carried ou t by hydrodistilatio using Clavenger type apparatus. 300 gr of *Euphorbia densa Schrenk* was boiled in water and with some drops of hydrochloric acid (2 mL, 10%) during 3 hours and the yield of essential oil was.0.84% (w/w). The essential oils obtained has yellowish color with characteristic odor. The oils were stored in a refrigerator until the analysis by GC-MS.

3.4. Evaluation the antioxidant activity:

The detection of the anti-radical activity is carried out by using 1,1-diphenyl-2-picrylhydydrazyl (DPPH), a stable radical having in aqueous solution a characteristic absorption maximum at 517 nm (violet). A methanolic solution of 0.1 µg / mL of the essential oil is prepared and then diluted to 0.05, 0.025 and 0.01 µg/ml. 0.15 ml of the essential oil solution was added to 3 ml of DPPH solution (0.025 g / l) or to 2,6-di-tert-butyl-4-hydroxyanisol (BHA). After 30 minutes at room temperature, the absorbance is recorded at 517 nm. The percentage of disappearance of the radicals (% D(DPPH)) is calculated using the following formula: %D(DPPH) =100 - (([DO]$_x$ / [DO]T) * 100), where the [OD]$_x$ is the absorbance measured for the tested simple and [DO]$_T$ is the absorbance of reference (solution of DPPH of 0.025g/l). We can determine the EC_{50} which represents the concentration of product to obtain 50% of antioxidant activity.

4. Results and discussion

4.1. Volatile Chemical Composition.

The figure 2 presents a typical chromatographic profile of essential oil from *Euphorbia densa Schrenk* by hydrodistillation (HD) using Clavenger type apparatus. The individual components of the oils were identified by GC/Mass, The Peaks identification and relative amounts of the various compounds present in the volatile fraction appear in Table 1. A total of 16 compounds representing 94% of the essential oil were characterized. The oil was dominated by four compounds representing the majority of the compinants : 1.8-ceniole(18.87%), carvacrol (13.32%), Linalol (13.61%), (*E*)-Caryophyllene (10.29%). The other compounds were mostly presented in low amounts. Thus, the oil of *E. denesa sherken* was rich in sesquiterpenes, mostly oxygenated sesquiterpenes and monoterpene. The analyse of table 1 shows that most of compounds are mentioned in other especies, but with difference in proportions.

According to the bibliographic studies, it is remarkable that, the essential oils extracted of *ephorbiacea* especially from *Croton* species are rich in terpenoids and phenylpropanoids sach as: Carvacrol or only in terpenoids [4]. The occurrence of α-pinene might be acharacteristic of the genus of croton of euphorbiacea, however, in larger number of espices studied of euphorbiacea, the major constituents is β-caryophyllene in contrast with the constituents of *Euphorbia densa Schrenk*. Where is 1,8-cineole, linalool and carvacrol were the main constituents [9].

However, It is useful to note that the essential oil of a large number of *euphorbia genus* were rich in caryophyllene and linalool as a major constituents or the β-caryophyllene and/or the α-pinene and the constituents varied greatly depending on the geographical location of the plant, and on the organ of the plant used to obtain the essential oil [4]. It is remarkable the low percentage of linalool in the oil of studied plant (10.35%) as well as the β-caryophyllene (10.61) in contrast of other genus of *euphorbia* But, as it dominated by 1,8-cineole, It is possible to classify the essential oil of *euphorbia denesa sharken* in the chemotypes of Saudi Arabian, according to the geographic effect, and that is normal from the point of view of geographic effect [10. 11].

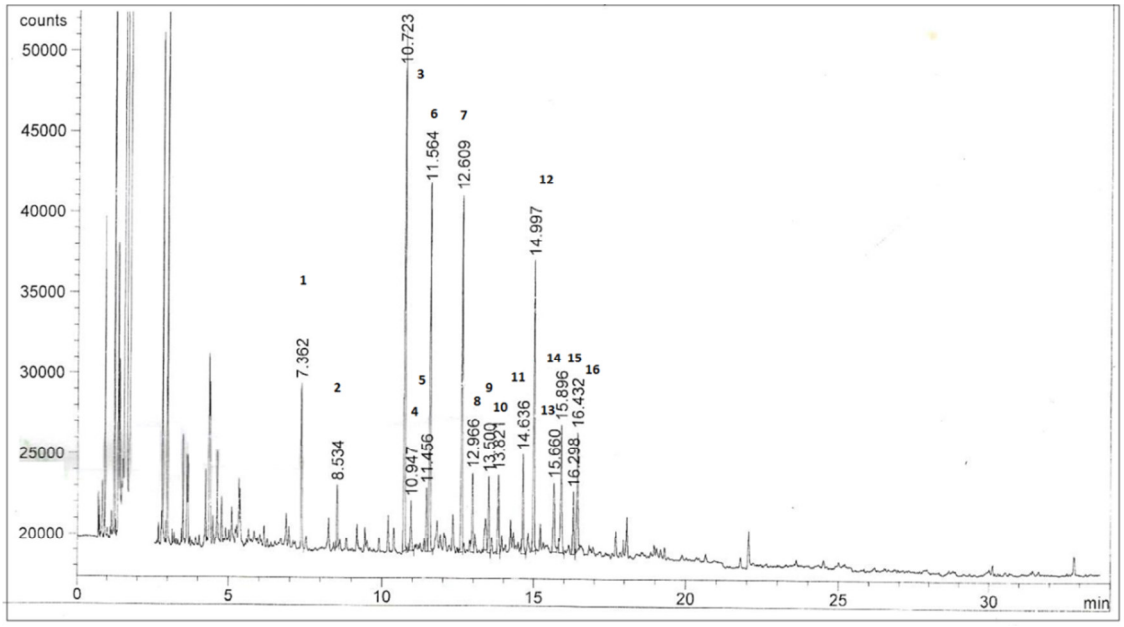

Figure 1: The GS chromatogram of essential oils obtained from dried aerial part of *Euphorbia densa Schrenk.*

Table 1. Chemical composition of essential oil extracted of *Euphorbia densa Schrenk.*

No	compound	RT	%	RI
1	α-pinine	7.36	5.41	1009
2	β-Pinene	8.53	2.14	1014
3	1,8-Cineole	10.72	18.87	1020
4	Limonene	10.94	1.95	1028
5	γ-Terpinene	11.45	2.47	1030
6	Linalool	11.56	13.61	1031
7	Carvacrol	12.60	13.32	1036
8	Thymol	12.96	3.32	1039
9	Valencene	13.50	2.95	1041
10	α-Terpinolene	13.82	3.77	1043
11	β-Elemene	14.63	3.70	1046
12	(*E*)-Caryophyllene	14.99	10.29	1049
13	α-Terpinolene	15.99	2.48	1053
14	Camphor	15.89	3.93	1055
15	\α-Humulene	16.29	2.46	1058
16	Spathulenol	16.43	3.91	1062

The essential oil exhibit significant activity aginist the stable DPPH free radical, it showed high antioxidant capacity wich indicated high radical-scavenging potentency with (EC_{50}=35 µg/100 ml) compared to reference, this evalution indicated the essential oil is free radical inhibitor, it means the essential oil contains different compounds which can react with free radicals, this can be commercially exploited or perhabs applied to cosmetic preperations as well. as addidtive to the foods (table 2).

Table 2: Free radical-scavenging of the essential oil from Euphorbia densa Schrenk.

Simple/reference	EC_{50} (µg/100 ml)
Essential oil	35
BHA*	13.5

*BHA: 2,6-di-tert-butyl-4-hydroxy-anisol.

4. Conclusion

This is the first report of essential oil composition of *euphorbia* from Syria By the conventional hydro-distillation extraction (HD). 16 compounds representing 94% of the essential oil were characterized. By the domination of four compounds as majority of the compinants : 1.8-ceniole(18.87%), carvacrol (13.32%), Linalool (13.61%), (*E*)-Caryophyllene (10.29%) The other compounds were mostly presented in low amounts. The *Euphorbia densa Schrenk* from *euphorbiacea* family is a natural source of antioxidants. The essential oil extracted this plant contains constituents with antioxidative properties and could serve as inhibitors or

scavengers of free radicals with EC50 =.35(µg/100 ml).

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6. References

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